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Is Property Ownership Important?
A Study of the Bovespa Demutualization Case

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Abstract

This article investigates the hypothesis that property structure of organizations is important for the products and services they supply. The analysis is accomplished through the study of the Brazilian Stock Exchange (Bovespa), which modified its property structure with demutualization and capital opening at the end of 2007. The New Institutional Economics (NIE) is the framework employed to understand the change since the neoclassic Industrial Organization fails to explain the process when emphasizes monopoly goal for contractual alterations and reformulations. By the NIE the property structure modification could result in deterioration of quality, due the necessity of for-profit firms to raise profits and cut costs, or improvement in quality, due to efficiency increase. This empirical question is evaluated through Lumsdaine and Papell's (1997) endogenous two structural break test, measuring the average bid-ask spread of all stocks negotiated at Bovespa. The result indicates there is a significant break in the series trend at the same period of the demutualization process, suggesting there was an improvement in the information quality with demutualization.

Key words: New Institutional Economics, Non For-Profit Organizations, Stock Exchange.

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1 Introduction

One of the most important facts occurred in financial markets in the last twenty years has been the change in the property structures of several stock exchanges. This process began in 1993 with demutualization of the Stockholm Stock Exchange, followed by modifications in other markets around the world. As a special sort of firm[1], stock exchanges can be for-profit private corporations, mutual structure of brokers, public companies of closed capital, among other alternatives. In the beginning of 2009, almost all the main stock exchanges of OCDE countries were corporations with explicit profit goals, and only three of them, Tokyo, Warsaw and Switzerland's, despite demutualized, had not listed their own stocks (OCDE, 2009). In 2007, Bovespa, the only Brazilian stock exchange in operation at that time and focus of this paper, changed its structure from a non for-profit civil association to become a for-profit corporation.

Among frequent explanations for changes in the property structures of stock exchanges are the need to raise capital and the search for larger efficiency in productive processes (e.g., Elliot, 2002; Lee, 2003). These needs became stronger with the technological revolution in place since the 1980's and consequent enlargement of international competition with other stock exchanges. For the New Institutional Economics (NIE), the change process is socially beneficial in the sense that modifications within enterprises take place to increase efficiency. Specifically, the referred school teaches us that administration monitoring is more efficient (Alchian and Demsetz, 1972) and there is a facility for obtaining financial capital (Hansmann, 1980) in organizations with profit goals.

Some previous papers analyzed the differences between stock exchanges with distinct property structures. Serifsoy (2007), for example, used the data envelopment analysis and the productivity index of Malmquist to evaluate the operational efficiencies of 28 exchanges, and concluded that property structure explains the differences in organizations, though in small magnitude. Krishnamurti, Sequeira and Fangjian (2003) evaluated some quality measures of two Indian stock exchanges with different property structures and concluded that the demutualized exchange (National Stock Exchange) offered better quality than its competitor with mutual structure (Stock Exchange of Bombay). Given the interest in understanding the differences between for-profit and non for-profit organizations, and furthermore, the importance of stock exchanges in the capital market, this work aims to accomplish an econometric exercise related to the demutualization of the Brazilian stock exchange. It does not intend to fully evaluate the process, but only verify if there was some statistically significant modification in average spreads, considered an informational quality measure, practiced at Bovespa around its change.

The analysis will be made using daily bid-ask spread series, applying Lumsdaine and Papell´s (1997) model of two endogenous structural breaks, testing the unity root null hypothesis against

[1] Under the lenses that firms are long term contractual relations, while markets are sets of spot transactions, stock exchanges should be classified as markets. Mulherim, Netter e Overdahl (1991) examined a set of external and internal contracts from New York Stock Exchange (NYSE) and Chicago Board of Trade (CBOT), framing them as particular cases of firms, which produce accurate information under quotes. This point of view is adopted in this paper for the Bovespa case.

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the alternative hypothesis of stationarity with trend. The choice for two breaks model instead of only one break model came from visual examination of data. Endogenous structural break models allow evaluating if the time of the change in the property structure of Bovespa is associated to some significant alteration in the bid-ask spread series behavior, with the advantage of not being necessary to specify the period of change *a priori*. The results indicate there is a significant break in the series trend at the same time the demutualization occurred. The reversal of bid-ask spread trend at the demutualization time suggests that the change in the property structure of the Brazilian stock exchange is associated with an improvement in the information quality it provides.

The paper is structured in five sections, including this introduction. In the second section, it will be presented the theoretical aspects related to changes in property structures. The third section is dedicated to methodological description and data presentation. The fourth section shows the results and the fifth and last section brings the final considerations.

2 Brief Literature Review

A potential theoretical base to analyze the change on property structure of stock exchanges is the neoclassic Industrial Organization, but it would not be convenient to employ this theoretical *constructo* to explain the change in the property structure of Bovespa. This is because it adopts a monopoly motivation for contractual alterations and reformulations (Coase, 1972; Williamson 1985 and 2008) and the Brazilian Stock Exchange detained *de facto* monopoly on stocks transactions in the country before demutualization occurred in 2007.

An alternative theoretical base is the New Institutional Economics (NIE), which advocates that the modifications in contractual structures occur as an endogenous process within organizations in their search for efficiency in the production and resource allocation processes. The New Institutional Economics fits the Kuhnian conception of paradigm (Kuhn, 1962), being composed by a family of theories built on the pillar of limited and bounded rationality, coherent with the observed real world.

The NIE confronts the rational agent with perfect foresight from neoclassic school, promoting a revolution in the economic thought of organizations. The year of 1937, when the classic "The Nature of Firm" by Ronald Coase was published is considered a mark of this revolution. Until then, economic literature used to fail to explain satisfactorily the reason why firms exist. Worried with markets, the mainstream theory, at that time, restricted itself considering organizations as "black-boxes", observing and studying them from a given production function. The NIE steps further adopting transaction as the focus of analysis, instead of markets. The firm was not seen as a hermetic unit being possible to examine it under several aspects neglected before.

For Williamson (2000), NIE's analyses walk among environments of formal institutions and governance structures. With this delimitation, the author considered that the informal restrictions related to habits and social traditions are already well known by analysts. In other words, changes happen in the long term and therefore are taken as fixed. In a simplified manner, the different theories that compose the NIE can be grouped in two major categories: The one of incentives and the one of transaction costs (Williamson, 1985). There are some common points among them, besides the object of analysis being transaction and not market as already cited. Among main congruities stands out the recognition of the importance of property rights, understood as rights to

use assets, rights of appropriation of assets, or rights to change assets form or substance. (Williamson, 1985, p.24) According to Buchanan (1975, p.225), to analyze the implicit mutual benefits in the voluntary transactions under the contracts lenses, and not under the neoclassic choice, allows a better comprehension of exchanges.

A wide view about property rights is Demsetz's, for whom they are "an instrument of society and derive their significance from the fact that they help a man form (…) expectations which he can reasonably hold in his dealings with others" (1967, p.347), being such expectations formed by laws and habits. With this characteristic, the property right owns the allocative function of internalize existing externalities, reducing the bargain costs involved in a conflict or business. In other words, the property rights specification determines how costs and rewards will be allocated. In addition, as the property rights are specified via contracts, the organizations managers' behavior will depend on the nature of these contracts.

Through the property rights theory is possible to explain, for example, business quality in stock exchanges. Two of the main products of a stock exchange is to publish information from companies, task shared with regulators like the Comissão de Valores Mobiliários – CVM -, in the Brazilian case, and information of the transactions accomplished in its business environment. In this sense, to make information on prices to be comparable over time, it is desirable certain standardization in contracts and stocks negotiated. That occurs with appropriated specification of property rights underlying the accomplished negotiations, like the sales dates and the rights that the new stock detainers will have. In this sense, a good stock exchange quality only will be obtained if property rights of the stocks traded are well specified.

In this property rights context, the limited liability over shares allowed the development of capital markets creating incentives for wealthy shareholders' participation. According to Demsetz,

> (…) "limited liability considerably reduces the cost of exchanging shares by making it unnecessary for a purchaser of shares to examine in great detail the liabilities of the corporation and the assets of other shareholders; these liabilities can adversely affect a purchaser only up to the extent of the price per share." (Demsetz, 1967, p.359)

The agency theory has developed independently from the property rights theory, in spite of the research goals of both being quite similar. In a classical paper related to agency theory, Berle and Means (1932) argued about the existence of a conflict problem between managers and stockholders' goals, pointing the company superiority under owner's management compared to corporations with dispersed property by stocks emission. Besides the accepted possibility of this conflict, at least partially, Berle and Mean's conclusions were confronted along history. For Jensen and Meckling (1976), for example, the bulky growth of open capital corporations suggests that the control diffusion benefit overcomes its costs. For Demsetz (1983), the existence of a high percentile of managers who are also stockholders with remuneration largely based on stocks performance and implicit monitoring imposed by the variations in the stock prices reduce the distance between managers' and stockholders' interests.

The conflict in the relation between managers and owners, coined as principal-agent relation, generated a range of works seeking to create mechanisms to align incentives *before* contracts

composition, aiming to increase efficiency of exchanges. In the real world, costs to redraw property rights are not null and different contractual relations defined *ex ante* cannot be efficient *ex post*. In this environment arises the second group of NIE's theory, called transaction costs theory, which proposes that agents' decisions after the contract formulation can be changed due to opportunistic behavior of agents, and together with non-negligible costs of legal system, allows larger focus in private institutions (or support institutions) *ex post* contracts.

The Transaction Costs Theory has developed from the perception that neglected transaction cost, or sometimes null transaction costs, adopted by the neoclassic theory, is not plausible in the real world. According to Coase (1937), the explanation for the existence of firms would be that they save transaction costs. Otherwise, the exchanges accomplished within firms would be done via market. This choice between to produce or to buy in the market is sensitive to attributes associated to the transactions. Specificities in investments to be made, whether locational, physical, or human, increase the current losses of a hold-up, an opportunistic behavior attributed to agents. Therefore, with high specificity in investments, integration would be the predominant governance structure, reducing transaction costs. Saha (2005), for example, justifies the stocks exchange appearance as organizations by the reduction of brokers' costs to negotiate with each other at the usual way, without sale and compensation warranties for their businesses, through a not organized market.

The warranties cited above can be made possible intrinsically by the property rights specification to the stocks negotiated, as commented previously, but they will only produce the desired result if such rights are guaranteed and accomplished by some formal organization supported by laws and habits. In this context, restrictions to over-the-counter business, which enjoy information about prices formed in stock exchanges but do not contribute with the costs associated to cover the publication of quotes, can be configured as an opportunistic behavior, that should increase costs of global transactions with stocks. Such conclusion endorses the change of the stock exchanges as closed organizations and suggests that monopolization of transactions improves well-being.

Alternative governance structures are also debated in NIE's context. Non for-profit and structured organizations such as cooperatives deserve special attention, dedicated by several authors. Some of these ideas are presented below.

2.1 Non For-Profit[2] and Cooperative Organizations

Hansmann (1980) sought to comprehend the role of non for-profit organizations, defined after the non-distribution restriction, which characterizes the impossibility of profit to be appropriated by the owners or sponsors.[3] The author has created a taxonomy for such organizations, embracing their finance and control structures. The finance structures could be commercial, in case they generated resources from their own activities, or based on donations. By the control structure, the organizations would be managerial, when they owned administration freedom given by their

[2] We prefer the use of the term non for-profit when referring to firms without profit goals, instead of only non-profits. This is because the use of the former term could mislead some interpretations, as the non for-profit firms could have profits yet without aiming it.

[3] Hansmann (1980) keeps the possibility of profits in non for-profit organizations. The existence of non for-profit organizations would require that stocks and shares would not exist, along with any other property right which permits the holder to control both management and profit distribution.

patrons, or mutual, when the backers exercise the control. For this taxonomy, Bovespa could be framed up as a commercial mutual and non for-profit organization up to 2007.

In 2001, Bovespa merged with other 11 Brazilian exchanges, forming a monopoly *de facto*. As the monopolist of stock trades in the country and still holding a mutual non for-profit structure, Bovespa could increase its prices or trading fees, but still members-brokers could not easily appropriate the excess profit. Noia (2000) explains the stock exchange cooperative old structure as a strategy to prevent some monopolistic rent appropriation given the market power of local stock exchange. Becoming a for-profit organization thus is justified as a mean to allow members to appropriate excess profits. Another explanation could be that non for-profit firms may suffer from multiple goals and conflicts. While some members may desire to minimize fees, others may pursue to maximize trading volume or other goals. Kanter and Summers (1987) for example point that non for-profit firms are temporary alliance of separate groups, each interpreting the organization´s goals a little differently. With different objectives, raising capital to invest in new technologies could be cumbersome, with some members desiring to invest more than others do. Furthermore, the horizon goal problem referred by Lee (1998) also makes investment difficult. Therefore, obstacles for obtaining financial capital, with the impossibility to offer stocks to the public, could help to justify the appearance of the for-profit form.

It is frequently argued that when a consumer is unable to correctly evaluate the promised and delivered product, whether by the transaction circumstance, or by the own characteristic of the product, there will be larger well-being if supply is accomplished by non for-profit organizations. That happens because, by the impossibility of profit distribution given by definition, non for-profit organizations have larger restrictions to increase prices or to cut quality. In other words the advantage of these organizations is that "the discipline of the market is supplemented by the additional protection given the consumer by another, broader 'contract', the organization's legal commitment to devote its entire earnings to the production of services" (Hansmann, 1980, p.844). On the other hand, Alchian and Demsetz (1972) compared non for-profit organizations to open capital corporations with profit goals pointing that could be expected larger opportunistic behavior, reducing average productivity, in the non for-profit organizations. This is because they do not enjoy monitoring through the possibility of easy and fast transfer of property rights, feature observed in open corporations. In other words, there is an efficiency lack in the administration of non for-profit organizations, due to incorrect alignment of incentives that absence of profit distribution provokes.

Hart and Moore (1996) analyzed precification of cooperatives with conflicting goals, i.e., organizations with or without profit goals. By the authors' model, which contemplates decisions by the average voter, in the case members' distribution hangs for the firms with larger production cost, the organization will prefer to act with profit goals. Moreover, in line with the result of Hansmann (1988), it can be argued that some deficiencies generated by the decisive process in cooperative will be minimized with their members' homogeneity. Differently, for Pirrong (1999) the cooperatives with profit goal should dominate non for-profit ones. His argument is based on the possibility of market power exercise that could occur in detriment to a cartel compelled by a non for-profit cooperative.

By the brief review exposed above, the NIE explains several aspects related to stock exchanges, such as its appearance and development. Moreover, it assists in the comprehension of changes in

the property structures of these organizations. Such changes could generate effects on the product supplied by the stock exchanges; i.e., information. Whether the change in the Brazilian stock exchange led to deterioration in quality or transaction cost for traders, due the necessity to raise profits and cut costs, or to an improvement in quality, due to the efficiency increase, is a question to be answered empirically.

3 Methodology and Data

The main goal of this paper is to verify if there is a break in the time series measure related to business quality of Bovespa around the period of change in its property structure. The measure employed is the daily average bid-ask spread from all stocks negotiated at Bovespa, $SPDAY_{i,t}$, calculated by the bid-ask spread of each stock leveraged by its business volume in each day.

Firstly we calculated $SP_{i,t}$, the difference between the last best bid ($BID_{i,t}$) and the last best ask ($ASK_{i,t}$) divided by the average of these two prices for each stock *i* in each day *t*. Algebraically:

(1) $$SP_{i,t} = (ASK_{i,t} - BID_{i,t}) / [(ASK_{i,t} + BID_{i,t}) / 2].$$

The daily average bid-ask spread ($SPDAY_t$) was then calculated for each day *t* multiplying $SP_{i,t}$ to the ratio of its volume ($VOL_{i,t}$) and the total volume negotiated at the same t ($\Sigma VOL_{i,t}$):

(2) $$SPDAY_t = \sum_{i=1}^{n} SP_{i,t} \left(VOL_{i,t} \Big/ \sum_{i}^{n} VOL_{i,t} \right)$$

A great deal of papers from the literature of finance investigates if there is a correlation between the costs to trade stocks and other variables, such as stock prices and transaction volume. It is common to these papers to employ the bid-ask spread as a proxy for the true transaction costs for trading stocks. A large spread means higher costs, that is, a buyer must pay a higher markup over price, and the seller must accept a higher discount than she would receive with narrow spread. Furthermore, the works of Atkins e Dyl (1997), Bessembinder (2003) and Amihud e Mendelson (2003) lead to the conclusion that there is a strong and negative correlation between volume and spread, meaning that traders will dislocate to market places with low costs. Thus, spreads from other market places and the volume could be considered as determinants of local spread. Some other variables, such as the market volatility and the brokers' concentration potentially affect the spread series created. The volatility is direct related to spread and an increase in brokers´ concentration could cause an increase of spread through rising direct costs of stock transactions due to their exercise of market power.

Evaluations of the change on property structure should expurgate the influence of bid-ask spread determinants cited above. Thus, the evaluation of structural break taken place here will contemplate the error term (u_t) of the estimation from ordinary least squares method of the following equation:

(3) $$SPMED_t = \beta_0 + \beta_1 SPADR_t + \beta_2 C8_t + \beta_3 VOL_t + \beta_4 DPBRA_t + u_t$$

where:

- $SPMED_t$ is daily bid-ask spreads ($SPDAY_t$), monthly averaged;

- $SPADR_t$ is a control variable, proxy for the NYSE spread. The variable used is the bid-ask spread average in month *t* exclusively from stocks with American Depositary Receipt. This variable aims to capture the costs from international markets;

- $C8_t$ is a control variable, calculated as the concentration ratio of the eight brokers with largest volume in Bovespa in month *t*;

- VOL_t is a control variable, calculated by the average volume for stock broker in month *t*; and

- $DPBRA_t$ is a control variable, calculated as the standard deviation of monthly average returns of Bovespa. This variable aims to capture the risk perception on Bovespa's stocks.

All the variables were employed in their logarithms, and they contemplate the period from April 1999 to August 2009, taken exclusively by data availability. The table 1 presents a statistical summary of the variables.

Table 1 – Descriptive Statistics

Variable (*)	Obs	Mean	Std.Dev.	Min	Max
$SPMED_t$	125	(5,00)	0,39	(5,87)	(4,12)
$DPBRA_t$	125	(3,60)	0,27	(4,03)	(2,56)
$SPADR_t$	125	(6,16)	0,41	(7,02)	(5,29)
$C8_t$	125	3,74	0,14	3,38	3,95
VOL_t	125	16,27	0,63	15,14	17,78

Source: www.bovespa.com.br.
(*): Variables in log

After having the error term from equation 3 in hand, we applied a test of endogenous structural break. These sorts of test evaluate the hypothesis of unitary root, against the alternative hypothesis of stationarity with trend. They can be employed, for instance, to evaluate the existence of change in the series due to public policies. Furthermore, if one treats political endogenously, the test extracts the period of level or trend rupture as a byproduct. The model employed was Lumsdaine and Papell´s (1997) because two apparent breaks were detected from visual inspection (see graph 1).

3.1 Models of Structural Break

The models of structural breaks have become popular after Perron's (1989) work, which called attention for the fact that the existence of structural breaks in time series data could influence the results of traditional unit root tests, such as Dickey-Fuller and Phillips-Perron. Ignoring permanent breaks in deterministic components of series, researchers who use conventional tests would tend to accept the null hypothesis of unit root more frequently than if the series were analyzed separately before and after the break.

Perron (1989) confronted Nelson and Plosser's (1982) results for thirteen macroeconomic series with those obtained by the new methodology. Perron (1989) rejected the null hypothesis of unit root for ten of them. Until that date, there was a reasonable consensus that macroeconomic series

were typically stochastic, instead of stationary with trend. In this way, shocks would have permanent effects in the series. Perron's (1989) results were based on the following generalization of Augmented Dickey-Fuller model with changes in level and trend:

(4) $$\Delta y_t = \rho.y_{t-1} + \sum_{j=1} \gamma.y_{t-j} + \mu_t + \varepsilon_t ,$$

where $\mu_t = \mu + \beta.t + \theta.DU_t + \gamma.(t - TB).DT_t$ is a deterministic term. The break occurs in time TB. Based on this model Perron (1989) worked with three possibilities of break:

- Model I – with trend and break on level:

$$\mu_t = \mu + \beta.t + \theta.DT_t ,$$

- Model II – with breaks on trend and level:

$$\mu_t = \mu + \beta.t + \gamma.(t - TB).DT_t ,$$

- Model III – combined:

$$\mu_t = \mu + \beta.t + \theta.DT_t + \gamma.(t - TB).DT_t ,$$

Where, for the three models,

$$DT_t = \begin{cases} 1, \; if \;\; t > TB \\ 0, \; if \;\; t \leq TB. \end{cases}$$

The null hypothesis for each one of these models is a unit root, with possible break captured by the dummies introduced. The alternative hypothesis reflects a stationary process with break. The shock period is identified *ex-ante* through economic intuition, what makes Perron's work to be characterized as an exogenous structural break model. During early 1990's, a new class of endogenous model emerges, standing out the ones of Zivot and Andrews (1992) and Lumsdaine and Papell (1997).

The Zivot and Andrews's (1992) endogenous structural model is characterized by a sequence of tests applying dummies for different periods. The break period is selected by the smallest *t* statistic. In other words, a break date is chosen where it is less favorable to the null hypothesis. As a result, this sort of test has larger difficulty in rejecting the hypothesis of unit root. The null hypothesis (H_0) of the test proposed by Zivot and Andrews (1992) can be exposed as:

$$H_0: \quad y_t = \mu + y_{t-1} + \varepsilon_t$$

The alternative hypothesis (H_1), as in Perron (1989), is composed in three different manners (A, B e C):

(A) H_{1A}: $$y_t = \mu + \beta.t + \theta.DU_\lambda + \alpha.y_{t-1} + \sum_{i=1}^{k} c_i.\Delta y_{t-i} + \varepsilon_t$$

(B) H_{1B}: $$y_t = \mu + \beta.t + \gamma.DT_\lambda + \alpha.y_{t-1} + \sum_{i=1}^{k} c_i.\Delta y_{t-i} + \varepsilon_t$$

(C) H_{1C}: $$y_t = \mu + \beta.t + \theta.DU_\lambda + \gamma.DT_\lambda + \alpha.y_{t-1} + \sum_{i=1}^{k} c_i.\Delta y_{t-i} + \varepsilon_t$$

where

$$DU_t = \begin{cases} 1, \ if \ \ t > TB \\ 0, \ if \ \ t \le TB \end{cases} \qquad \text{and} \qquad DT_t = \begin{cases} t - TB, \ if \ \ t > TB \\ 0, \ if \ \ t \le TB. \end{cases}$$

The break point TB is chosen to minimize the *t* statistics of the ADF test, with the most negative values leading to the rejection of the null hypothesis. The selection of one model (A, B or C) is not consensual. A conservative approach is to work with model C, the most general of all.

Lumsdaine and Papell (1997) amplify Zivot and Andrews's (1992) work allowing the possibility for a second endogenous break in the series, under the alternative hypothesis of stationarity with trend, and breaks in the level and in the trend. The authors re-examined Nelson and Plosser's (1982) series, testing them for two unknown breaks, rejecting the null hypothesis of unitary root for five of the thirteen macroeconomic series.

Lumsdaine and Papell´s (1997) test uses a similar logic employed by Zivot and Andrews (1992). The AA model allows two breaks in the intercept and the CC model allows two breaks in the intercept and in the slope. Finally, the model CA has a break in the intercept and in the trend, and a break in the intercept only. These three models can be written as:

(AA) $$y_t = \mu + \beta.t + \theta_1.DU1_t + \gamma_1.DT1_t + \alpha.y_{t-1} + \sum_{j=1}^{k} c_i.\Delta y_{t-i} + \varepsilon_t$$

(CC) $$y_t = \mu + \beta.t + \theta_1.DU1_t + \gamma_1.DT1_t + \theta_1.DU2_t + \gamma_2.DT2_t + \alpha.y_{t-1} + \sum_{j=1}^{k} c_i.\Delta y_{t-i} + \varepsilon_t$$

(CA) $$y_t = \mu + \beta.t + \theta_1.DU1_t + \gamma_1.DT1_t + \theta_1.DU2_t + \alpha.y_{t-1} + \sum_{j=1}^{k} c_i.\Delta y_{t-i} + \varepsilon_t \ ,$$

where the dummies *DU*1 and *DU*2 capture changes in the intercept and the trend dummies are *DT*1 e *DT*2, where

$$DU1_t = \begin{cases} 1, \ if \ \ t > TB1 \\ 0, \ if \ \ t \le TB1 \end{cases} \qquad \text{and} \qquad DU2_t = \begin{cases} 1, \ if \ \ t > TB2 \\ 0, \ if \ \ t \le TB2 \end{cases} \ ,$$

$$DT1_t = \begin{cases} t - TB1, \; if \;\; t > TB1 \\ 0, \; if \;\; t \le TB1 \end{cases} \quad \text{and} \quad DT2_t = \begin{cases} t - TB2, \; if \;\; t > TB2 \\ 0, \; if \;\; t \le TB2 \end{cases}.$$

As in the Zivot and Andrews's (1992) model, the tests of two breaks in TB1 e TB2 are done in period from k+2/T to (T-1)/T, furthermore implying $TB2 > TB1 + 1$. The following estimation refers to model CC, the most general of the three.

4 Results

We first conducted the estimation of equation 3 to get error series and proceeded to appreciation of any structural break on it. The estimation was satisfactory, with high R-squared (72.8%) and individual statistics of almost all variables showing significant results with expected signals. The exceptions occurred with the parameter of $DPBRA_t$, a risk measure that showed no impact in spread average, and VOL_t, that showed signal different from expected. On the other hand, as expected, the parameter of variable $SPADR_t$ suggests that spread of the Brazilian stocks are influenced by the spread in the world market, the variable $C8_t$ suggests that an increase in the broker´s market power reduces average spread. The main estimation results can be seen at table 2.

Table 2 – Estimation Results from Equation 3
(Endogenous: *SPMED*)

Variable	Coefficient	*t* statistics	p-value
$DPBRA_t$	0,0408	0,57	0,571
$SPADR_t$	0,6568	9,32	0,000
$C8_t$	-2,116	-12,61	0,000
VOL_t	0,2241	4,11	0,000
Constant	3,4711	5,83	0,000
125 observations - R^2: 0,728 - F Statistic: 84,08			

Source: Author

The graph 1 presents the evolution of errors, where the vertical bars indicate important events that could have influenced changes in the bid-ask spread structure, listed below:

(#1) January/2000: Merger agreement of twelve Brazilian stock exchanges

(#2) August/2001: Operational merger of twelve stock exchanges

(#3) September/2001: Terrorist attacks in New York

(#4) August/2007: Demutualization approval from CVM

(#5) October/2007: Bovespa Initial Public Offer

(#6) March/2008: Merger announcement between BM&F and Bovespa

Graph 1 – Error term (u_t) from equation 3 with event dates

#1 #2 #3 #4 #5 #6

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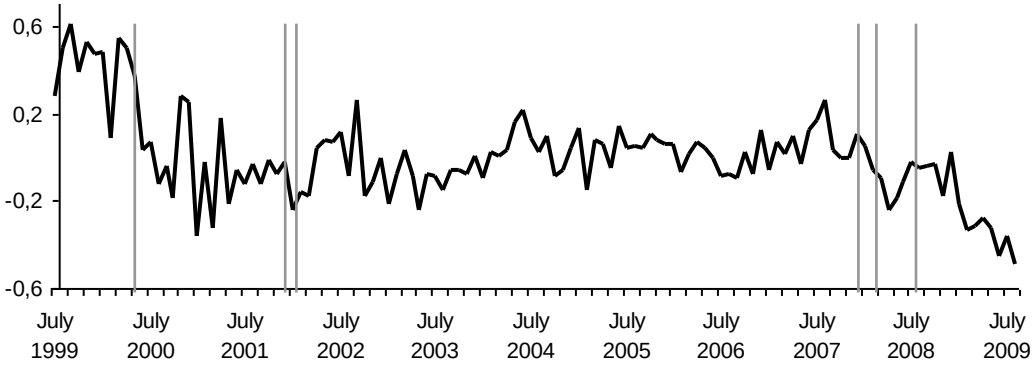


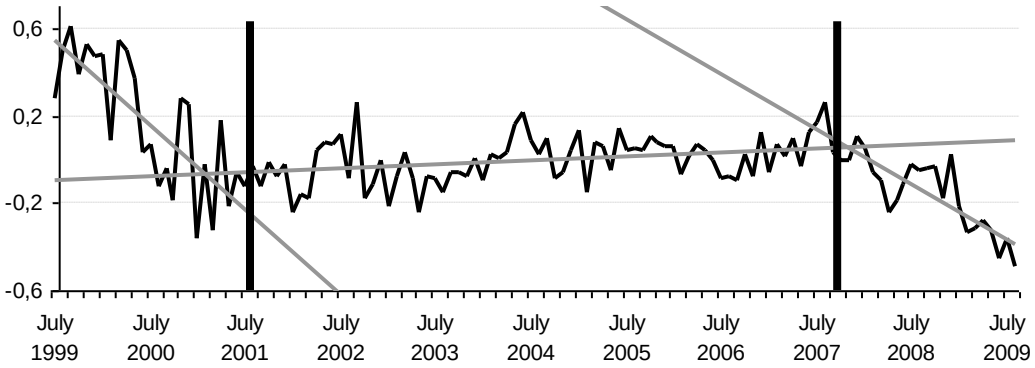
Source: Author

Visual examination of graph 1 suggests that error series present trends, with breaks short before stock exchanges mergers and around Bovespa's demutualization. For an evaluation of the series behavior and the possible break dates, we apply the model CC from Lumsdaine and Papell (1997), which estimation results, without the augmented term, are shown below:

$$\begin{array}{cccccccccc} y_t & = & 0{,}41 & - & 0{,}022\,t & + & 0{,}080\,DU1_t + 0{,}023\,DT1_t + 0{,}095\,DU2_t - 0{,}015\,DT2_t - 0{,}614\,y_{t-1} \\ & & (5{,}259) & & (-4{,}69) & & (1{,}321) \quad (4{,}745) \quad (1{,}549) \quad (-3{,}82) \quad (-6{,}08) & & \\ & & [0{,}000] & & [0{,}000] & & [0{,}189] \quad [0{,}000] \quad [0{,}124] \quad [0{,}000] \quad [0{,}05] & , & \end{array}$$

The values in parentheses are the *t* statistics and the values in brackets are the p-values. Statistically, the results indicated there were breaks in the tendency, however not in the intercept of the series. By the accomplished estimation, one does not reject the null hypothesis of unitary root at 5% confidence level, in favor of stationary series with breaks.

Graph 2 – Error term (y_t) with trends and break dates



Source: Author

Graph 2 presents again the error terms from equation 3 but with grey lines indicating the series tendencies and the vertical thick lines indicating the periods of structural breaks, which the results suggest occurred in March-2001 and May-2007. The first date is short before the announcement and effective merger of the Brazilian Stock Exchange. The second date is short after the demutualization announcement and the capital offering by Bovespa. In this way, the results go along with the idea that that the stock exchanges merger and Bovespa's demutualization induced

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effects in its conduct. Furthermore, while the merge is associated to fall in quality (transaction costs or spreads elevation), demutualization is associate with an improvement in quality (transaction costs or spreads fall).

5 Final Considerations

Changes in property ownership structure are important events to be investigated, especially those related to demutualization of stock exchanges, process which began in 1993 with the change of ownership structure of Stockholm Stock Exchange. The subject is relevant because of the magnitude of values traded in stock markets and also it opens the theoretical discussion about the inappropriateness of neoclassic economics to explain these types of phenomena. In this sense, this paper explores Bovespa's demutualization process, occurred in 2007. Its main goal is to answer the question if the change in the property ownership structure is associated with any change in the quality of service the Exchange provided.

There are different theoretical explanations for the phenomena given by two different schools. The neoclassic school emphasizes the monopoly motivation extensively. For this school a firm would engage in a change in its property structure to achieve its monopoly goal. On the other hand, the New Institutional Economics stresses endogenous motivation of firms in their search for efficiency or reduction of transaction cost. Since Bovespa detained a de facto monopoly when demutualized in 2007, neoclassic school could not be employed to explain the ownership change.

The NIE helps to understand some issues related to stock exchanges. By the property right context is possible to understand how a correct specification of contracts, i.e., share owner rights, can increase quality of a market place such as stock exchange. Also, the reduction of transaction costs between brokers explains the appearance of stock exchanges as an organized market. The NIE gives several indications about the quality variations with different ownership structures. A move from a mutual structure to a for-profit corporation could lead to a decrease in quality, due to the possibility of monopoly rent appropriation; or to an improvement in quality, due to more efficient allocation of resources. In short, there might not be a single answer to this question, which should be treated case by case. This empirical investigation constructed daily average bid ask spread from all stocks negotiated at Bovespa and used it as a measure of quality or transaction cost. Several papers endorse this choice of variable as a reference for quality (Amihud and Mendelson, 2003; Atkins and Dyl, 1997; and Ofer and Melnik, 1978), but it is still a fragile choice that our results depend on.

The empirical analysis employed time series tools, evaluating the existence of structural breaks in bid-ask spread series. The model utilized was the Lumsdaine and Papell's (1997) two structural break model, after visual evaluation indicated two breaks in the series. The results suggest that there were breaks in spreads tendency in March 2001 and May 2007, close to the dates when merger announcement and Bovespa's demutualization took place. Moreover, it rejected the hypothesis of stationary unitary root in favor of breaks and tendency, suggesting that random shock in the series has temporary effects, with tendency of series to return to their long-term path. The analysis also indicates that the Bovespa's demutualization is associated with a decrease in transaction cost (or an increase in average quality).

Finally, the results show that demutualization did not produce higher costs to traders, as a naive regulator could urge, due to the possibility of exercise of monopoly power from Bovespa. In fact,

the spreads revealed the opposite direction, with smaller transaction costs to traders after demutualization.

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